

**THE INFLUENCE OF THE USING OF VIRTUAL LABORATRY ON THE
CHEMISTRY LEARNING ACHIEVEMENT AND MOTIVATION OF
SCIENCE STUDENTS OF SMA NEGERI 1 SEWON BANTUL
ELEVENTH GRADE SECOND SEMESTER
ACADEMIC YEAR 2015/2016**

Pangestika Nur Afnia and M. Pranjoto Utomo

Department of Chemistry Education, Faculty of Mathematics and Science

State University of Yogyakarta

e-mail : pranjoto_utomo@uny.ac.id

Abstract

This study was to determine the significant difference in motivation to learn chemistry of students before and after the use of acid-base virtual laboratory of those between students who use acid-base virtual laboratory in practicum activity and who do not of those if prior knowledge is statistically controlled.

This study was research experiment with one factor design, two variables, and one co-variable. The factor is learning media, the variables are motivation and learning achievement, the co-variable is prior knowledge. Two samples are experiment and control classes. The data were collected by documentation technique, test, and questionnaire. The difference of motivations and achievements use analyzed using paired sample t-test, independent sample t-test, and covariant test.

The results showed that there is any significant difference in the motivation of students before and after the using of acid-base virtual lab, there is no significant difference in the increasing of motivation to learn chemistry or not between the students who used acid-base virtual lab in practicum activity with who did not, and there is no significant increasing in achievement and motivation to learn chemistry if prior knowledge is statistically controlled.

Keywords: *virtual lab, motivation, learning achievement.*

INTRODUCTION

Education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that students are actively develop the potential for themselves to have the spiritual power of religion, self-control, personality, intelligence, character, and skills that they needed, society, state and nation (UU Sisdiknas, 2003). One of the efforts is the implementation of education through the learning process. The learning process is the interaction between teachers and students where students also have to play an active role during the learning process.

One of the problems faced by the world of education is the lack of a learning process (Sudarman, 2007). This is an issue in all subjects in school including chemistry. Understanding the concept of learning chemistry is not enough to have just delivered in the form of theory only, but must be supported by a real experience of the students and makes learning more meaningful.

Virtual Laboratory is a system that can be used to support the conventional laboratory (Hendra Jaya, 2012). The use of laboratory models is beneficial when the practicum obviously did not possible to conduct due to particular constraints. Thus, the virtual laboratory provide opportunities for the students to perform chemistry laboratory in the absence of real laboratory. This study uses crocodile chemistry 605 software which was published by the Crocodile Licence.ltd. The software provides variety of tools and materials for practicum activities and its functions, the chemical reactions and the molecule geometry so that students can perform chemistry learning through virtual practicum without having to be in a real laboratory.

The purpose of this study is to determine whether there is any significant difference in motivation to learn chemistry or not before and after the using of acid-base virtual lab of grade XI students of SMA N 1 Sewon Bantul semester 2 academic year 2015/2016, to determine whether there

is any significant increasing in motivation to learn chemistry or not between the students who use acid-base virtual lab in practicum activity and who do not, and to determine whether there is any significant difference in learning achievement or not between the students of grade XI SMA N 1 Sewon Bantul semester 2 academic year 2015/2016 if prior knowledge is statistically controlled.

RESEARCH METHOD

The method used in this study is an experimental method which aims to determine the effect of a treatment to research subject. The study design is experiment with the one-factor, two-samples, two variables and one covariate. One factor is the effect of the use of virtual learning laboratory of acid-base chemistry grade XI science on achievement and motivation learning chemistry of students. Two samples are experimental class and control class. Experimental class is the class that was given treatment of virtual labs application to students. Control class is the class that was given treatment of real laboratory to

students. Two variables are chemistry learning achievement and motivation to learn chemistry. One covariate as chemical control is the prior knowledge of students in the form of chemistry final examination mark of grade XI at odd semester.

The population in this research were the students of grade XI science program of SMA Negeri 1 Sewon Bantul semester 2 academic year 2015/2016. The amount of a whole population were 59 students and divided into two classes, called control class and experiment class. The sampling technique is purposive cluster sampling, where two classes taken have similar an average value and all the students in the class were treated as the research sample. Experimental class is a class that was given treatment of virtual labs on laboratory activities of acid-base material. While control class is a class that was not given treatment such as the use of virtual labs on laboratory activities of acid-base material.

The measurement of chemistry learning achievement used post test

with 25 questions and validated theoretically and empirically. While the motivation of chemistry learning used motivation questionnaire accompanied by five alternative answers. The measurements were made according to Likert scale where the positive questions scored 5 (SL), 4 (SR), 3 (KD), 2 (A), 1 (TP) and the negative question has a score of 1 (SL), 2 (SR), 3 (KD), 4 (A), 5 (TP). The questionnaire was validated logically.

RESULTS DAN DISCUSSIONS

The virtual laboratory is a series of laboratory equipment in the form of software computer-based interactive multimedia and can simulate the activity in the laboratory as if the user is in the actual laboratory. By this students are trained to think and perform virtual experiments. In this research, researchers try to investigate the influence of the application of acid-base virtual laboratory on the learning achievement and motivation of grade XI students of SMA Negeri 1 Sewon Bantul.

The results of the initial motivation and prior knowledge were then tested by using SPSS 16 for windows to recognize that these two classes under normal circumstances and homogeneous. Normality test showed that significance degree for experiment class are 0.526 for initial motivation and 0.376 for prior knowledge. Whereas for control class are 0.116 for initial motivation and 0.568 for prior knowledge. Homogeneity test showed that significance degree is 0.262 for initial motivation and 0.345 for prior knowledge. The significance result of normality and homogeneity test were greater than 0.05, so that it can be stated that the two classes are normally distributed and homogeneous.

Paired sample t-test showed significance degree 0.00 for experiment calss and 0.031 for control class. It showed that there was significant increase for experiment class and no significant increase for control class. Independent sample t-test showed significance degree is 0.129 that means there is no significant

difference in motivation to learn chemistry between students who use acid-base virtual laboratory and who do not. While the anacova test showed significancy degree 0.908 that means there is no significant difference in academic achievement between students of class XI who use acid-base virtual laboratory who do not if the prior knowledge is statistically controlled.

CONCLUSION

The use of acid-base virtual labs increase motivation and achievement of the students. There are significant difference in the motivation of grade XI science students before and after the using of acid-base virtual lab of SMA N 1 Sewon Bantul semester 2 academic year 2015/2016 and no significant difference in motivation to learn chemistry between students who use acid-base virtual laboratory and who do not. While for chemistry learning achievement there is no significant difference between students of class XI Semester 2 who use acid-base virtual laboratory who do not if

the prior knowledge is statistically controlled.

REFERENCES

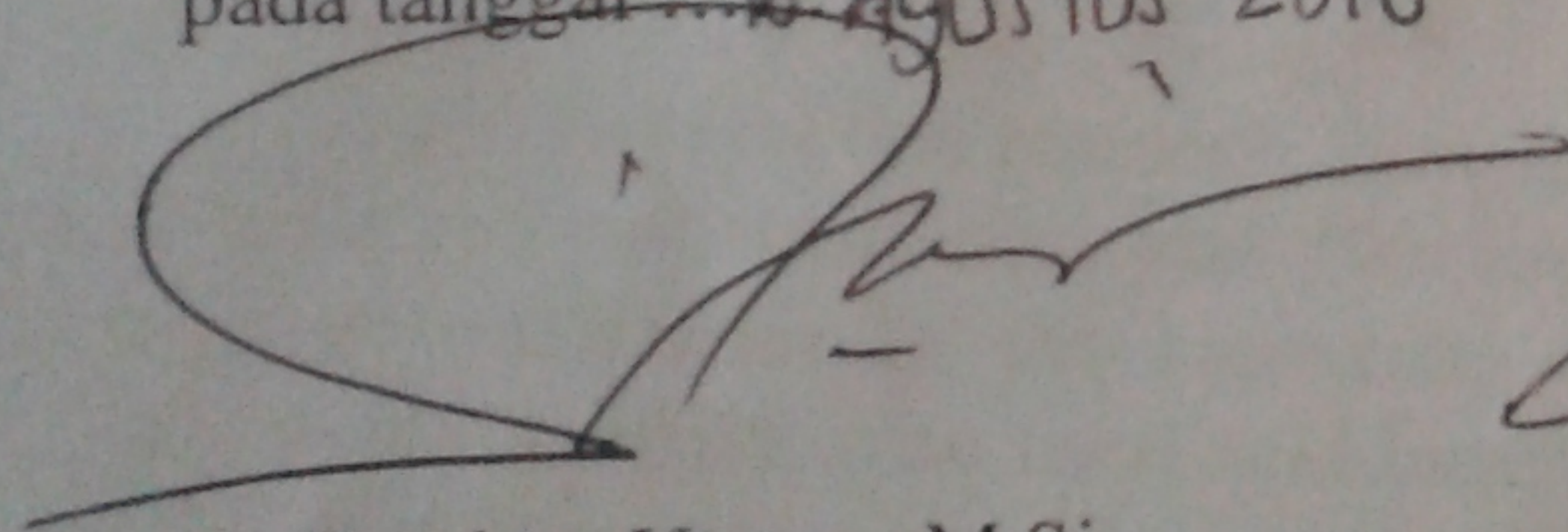
1. Achmad Kholish Ghalib. (2009). *Buku Pintar Kimia*. Yogyakarta: Power Books
2. Alwi Hasan, dkk. (2005). *Kamus Besar Bahasa Indonesia*. Jakarta : Departemen Pendidikan Nasional Balai Pustaka
3. Arief S. Sadiman, R.Rahardjo, Anung Haryono & Rahardjito. (2011). *Media Pendidikan*. Jakarta: Rajawali Press.
4. Arif Yoga Pratama. (2015). Penerapan Multimodal Learning melalui Pembelajaran Kooperatif Tipe Think Pair and Share (TPS) Berbasis Web untuk Meningkatkan Motivasi dan Prestasi Belajar Peserta didik. *Skripsi*. Yogyakarta: FMIPA UNY
5. Aulia Rahmawati. (2014). Efektivitas Penerapan Media Pembelajaran Edmodo Berbasis Kelas Online terhadap Motivasi dan Prestasi Belajar Larutan Asam Basa pada Peserta Didik Kelas XI SMA N 1 Wates Semester Genap Tahun Ajaran 2013/2014. *Skripsi*. Yogyakarta: FMIPA UNY
6. Cengiz Tüysüz. (2010). The Effect of the Virtual Laboratory on Students' Achievement and Attitude in Chemistry. *Journal International Online Journal of Educational Sciences*, 2010, 2 (1), 37-53
7. Dwiy. (2009). Pengkajian Laboratorium Virtual.

- Yogyakarta: SMA
Muhammadiyah 2
8. Emzir. (2012). *Metodologi Penelitian Pendidikan: Kuantitatif dan Kualitatif*. Jakarta: Rajawali Press
 9. Hamzah B. Uno, Satria Koni. (2013). *Assesment Pembelajaran*. Jakarta: Bumi Aksara.
 10. Hamzah B. Uno. (2007). *Model Pembelajaran*. Jakarta: Bumi Aksara.
 11. Hamzah B. Uno. (2007). *Teori Motivasi dan Pengukurannya*. Jakarta: Bumi Aksara
 12. Hardjono Sastrohamidjojo. (2008). *Kimia Dasar*. Yogyakarta: Gadjah Mada University Press
 13. Hendra Jaya. (2012). Pengembangan Laboratorium Virtual Untuk Kegiatan Praktikum dan Memfasilitasi Pendidikan Karakter di SMK. *Jurnal Pendidikan Vokasi Jurnal Pendidikan Vokasi, Vol 2, Nomor 1, Februari 2012*
 14. Hiskia Achmad & Lubna Baradja. (2012). *Demonstrasi sains kimia jilid 2: kimia deskriptif melalui demo kimia*. Bandung: Nuansa
 15. I Made Sukarna. (2003). *Kimia Dasar 1*. Yogyakarta: Jurusan Pendidikan Kimia FMIPA UNY
 16. Made Wena. (2009). *Strategi Pembelajaran Inovatif Kontemporer: Suatu Tinjauan Konseptual Operasional*. Jakarta: Bumi Aksara
 17. Mulyati Arifin, et.al. (2005). *Strategi Belajar Mengajar Kimia*. Malang: UM Press
 18. Oemar Hamalik. (2001). *Proses Belajar Mengajar*. Jakarta: Bumi Aksara
 19. Oemar Hamalik. (2005). *Kurikulum dan Pembelajaran*. Jakarta: Bumi Aksara
 20. Ratna Wilis Dahar dan Liliarsari. (1986). *Pengelolaan Pengajaran Kimia*. Jakarta: Departemen Pendidikan dan Kebudayaan Universitas Terbuka
 21. Raymond Chang. (2005). *Kimia dasar: konsep-konsep inti jilid 1*. Jakarta: Erlangga
 22. Rr. Lis Permana Sari dan Sukisman Purtadi. (2012). Model Kelas Laboratorium Virtual Kimia Berbasis Muve-Chemistry Workshop On Secondlife- Untuk Meningkatkan Keterampilan Proses Sains Siswa Sma. *Jurnal Pendidikan Kimia FMIPA UNY. Hlm.1-2*
 23. Slameto. (2003). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Jakarta: PT Asdi Mahasatya
 24. Sudarman. (2007). Problem Based Learning : Suatu Model Pembelajaran untuk Mengembangkan dan Meningkatkan Kemampuan Memecahkan masalah. *Jurnal Pendidikan Inovatif, Vol 2 (2), 6 halaman*
 25. Sugiyono. (2013). *Cara Mudah Menyusun Skripsi, Tesis, dan Disertasi*. Bandung: Alfabeta
 26. Sukardjo M. (2009). *Landasan Pendidikan Konsep Dan Aplikasinya*. Jakarta: Rajawali Pers

(2013). Pengembangan Chemistry Academic Blog sebagai Sumber Belajar Mandiri Peserta Didik SMA/MA Kelas XI Semester Genap Materi Asam Basa. *Skripsi*. Yogyakarta: FMIPA UNY

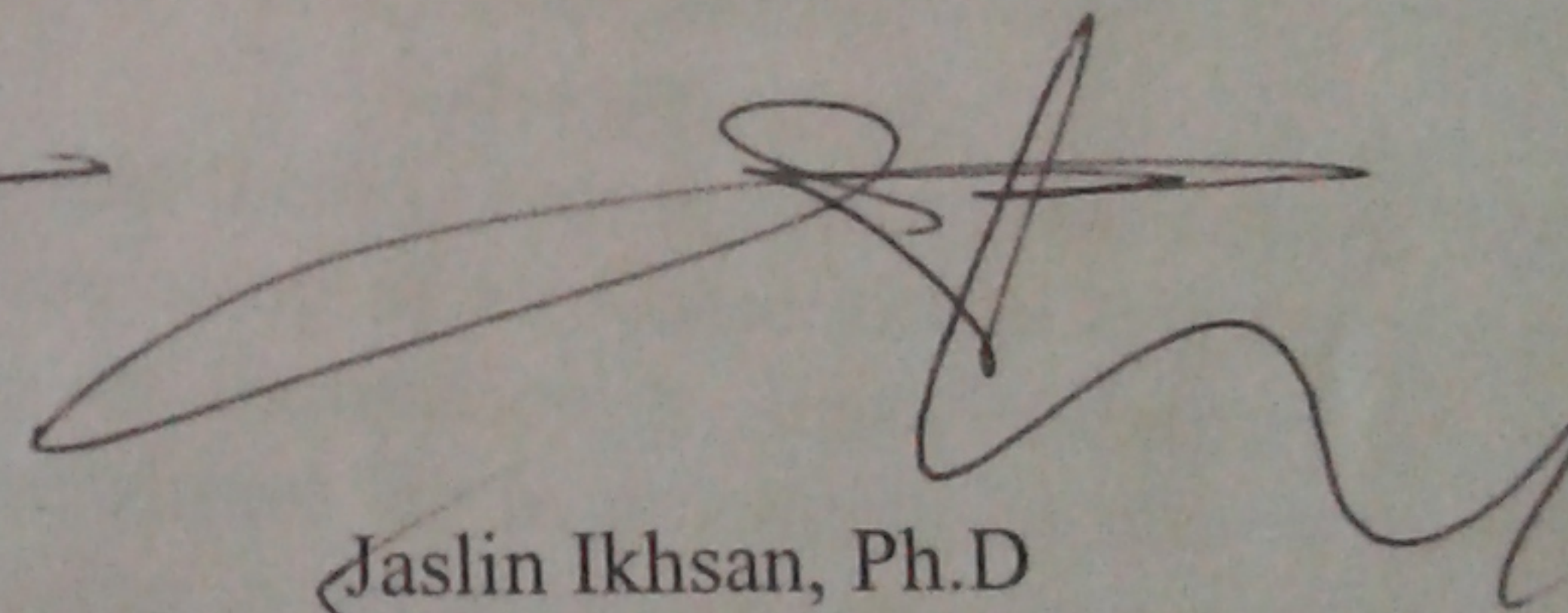
31. Zeynep Tatli and Alipasa Ayas. (2013). Effect of a Virtual Chemistry Laboratory on Students' Achievement. *Journal Educational Technology & Society*, 16 (1), 159-170.

Artikel ini telah disetujui untuk diterbitkan oleh Pembimbing I pada tanggal ~~16~~ Agustus 2016



M. Pranjoto Utomo, M.Si
NIP. 19710408 199802 1 002

Artikel ini telah direview oleh Penguji Utama pada tanggal 15 Agustus



Jaslin Ikhsan, Ph.D
NIP. 19680629 199303 1 001

**PENGARUH PENGGUNAAN *VIRTUAL LAB* TERHADAP PRESTASI
DAN MOTIVASI BELAJAR KIMIA PESERTA DIDIK KELAS XI MIA
SMA NEGERI 1 SEWON BANTUL SEMESTER 2
TAHUN AJARAN 2015/2016**

Oleh:
Pangestika Nur Afnia
12314244020

Dosen Pembimbing: M. Pranjoto Utomo, M.Si

ABSTRAK

Penelitian ini bertujuan untuk mengetahui ada tidaknya perbedaan motivasi belajar peserta didik yang signifikan sebelum dan sesudah diberi perlakuan penerapan virtual lab pada kegiatan praktikum, ada tidaknya perbedaan peningkatan motivasi belajar kimia peserta didik yang signifikan yang menggunakan virtual lab dengan peserta didik yang tidak menggunakan virtual lab pada kegiatan praktikum, ada tidaknya perbedaan pengaruh penggunaan virtual lab terhadap peningkatan prestasi dan motivasi belajar kimia peserta didik jika pengetahuan awal dikendalikan secara statistik.

Penelitian ini termasuk penelitian eksperimen dengan desain satu faktor, dua sampel, dua variabel dan satu kovariabel. Satu faktor yang dimaksud adalah pengaruh penggunaan laboratorium virtual pada pembelajaran kimia asam basa kelas XI terhadap prestasi dan motivasi belajar kimia peserta didik. Dua sampel yang digunakan adalah kelas eksperimen dan kelas kontrol. Kelas yang diberikan perlakuan berupa penggunaan laboratorium virtual kepada peserta didik disebut kelas eksperimen sedangkan kelas yang tidak diberi perlakuan penggunaan laboratorium virtual disebut sebagai kelas kontrol. Dua variabel yang dimaksud adalah prestasi belajar kimia dan motivasi belajar kimia. Satu kovariabel kendalinya adalah pengetahuan awal kimia peserta didik yang berupa nilai UAS kimia kelas XI semester 1. Pengumpulan data dilakukan dengan teknik dokumentasi, soal, dan angket. Data mengenai motivasi dan prestasi belajar dianalisis menggunakan uji-t sama subjek, uji-t beda subjek, dan uji anakova.

Hasil penelitian menunjukkan ada perbedaan motivasi belajar kimia peserta didik yang signifikan sebelum dan sesudah menggunakan virtual lab, tidak ada perbedaan peningkatan motivasi belajar kimia peserta didik yang signifikan antara peserta didik yang menggunakan virtual lab dengan peserta didik yang tidak menggunakan virtual lab, dan tidak ada perbedaan prestasi belajar yang signifikan antara peserta didik yang menggunakan virtual lab dengan peserta didik yang tidak menggunakan virtual lab apabila pengetahuan awal dikendalikan secara statistik.

Kata kunci: virtual lab, motivasi, prestasi belajar.

**THE INFLUENCE OF THE USE OF VIRTUAL LABORATORY ON
CHEMISTRY LEARNING ACHIEVEMENT AND MOTIVATION
OF SCIENCE STUDENTS OF SMA NEGERI 1 SEWON
BANTUL GRADE XI SEMESTER 2
ACADEMIC YEAR 2015/2016**

By:
Pangestika Nur Afnia
12314244020

Supervisor: M. Pranjoto Utomo, M.Si

ABSTRACT

This study was to determine the significant difference in motivation to learn chemistry of students before and after the use of acid-base virtual laboratory of those between students who use acid-base virtual laboratory in practicum activity and who do not of those if prior knowledge is statistically controlled.

This study was research experiment with one factor design, two variables, and one co-variable. The factor is learning media, the variables are motivation and learning achievement, the co-variable is prior knowledge. Two samples are experiment and control classes. The data were collected by documentation technique, test, and questionnaire. The difference of motivations and achievements use analyzed using paired sample t-test, independent sample t-test, and covariant test.

The results showed that there is any significant difference in the motivation of students before and after the using of acid-base virtual lab, there is no significant difference in the increasing of motivation to learn chemistry or not between the students who used acid-base virtual lab in practicum activity with who did not, and there is no significant increasing in achievement and motivation to learn chemistry if prior knowledge is statistically controlled.

Keywords: *virtual laboratory, motivation, learning achievement.*

BIBLIOGRAPHY

- Achmad Kholish Ghalib. (2009). *Buku Pintar Kimia*. Yogyakarta: Power Books
- Alwi Hasan, dkk. (2005). *Kamus Besar Bahasa Indonesia*. Jakarta : Departemen Pendidikan Nasional Balai Pustaka
- Arief S. Sadiman, R.Rahardjo, Anung Haryono & Rahardjito. (2011). *Media Pendidikan*. Jakarta: Rajawali Press.
- Arif Yoga Pratama. (2015). Penerapan Multimodal Learning melalui Pembelajaran Kooperatif Tipe Think Pair and Share (TPS) Berbasis Web untuk Meningkatkan Motivasi dan Prestasi Belajar Peserta didik. *Skripsi*. Yogyakarta: FMIPA UNY
- Aulia Rahmawati. (2014). Efektivitas Penerapan Media Pembelajaran Edmodo Berbasis Kelas Online terhadap Motivasi dan Prestasi Belajar Larutan Asam Basa pada Peserta Didik Kelas XI SMA N 1 Wates Semester Genap Tahun Ajaran 2013/2014. *Skripsi*. Yogyakarta: FMIPA UNY
- Cengiz Tüysüz. (2010). The Effect of the Virtual Laboratory on Students' Achievement and Attitude in Chemistry. *Journal International Online Journal of Educational Sciences*, 2010, 2 (1), 37-53
- Elizabeth C. Eckhoff, Vicki M. Eller, Steve E. Watkins and Richard H. Hall. (2002). Interactive Virtual Laboratory for Experience with a Smart Bridge Test. *Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition*
- Emzir. (2012). *Metodologi Penelitian Pendidikan: Kuantitatif dan Kualitatif*. Jakarta: Rajawali Press
- Hamzah B. Uno, Satria Koni. (2013). *Assesment Pembelajaran*. Jakarta: Bumi Aksara.
- Hamzah B. Uno. (2007). *Model Pembelajaran*. Jakarta: Bumi Aksara.
- Hamzah B. Uno. (2007). *Teori Motivasi dan Pengukurannya*. Jakarta: Bumi Aksara
- Hardjono Sastrohamidjojo. (2008). *Kimia Dasar*. Yogyakarta: Gadjah Mada University Press
- Hendra Jaya. (2012). Pengembangan Laboratorium Virtual Untuk Kegiatan Praktikum dan Memfasilitasi Pendidikan Karakter di SMK. *Jurnal Pendidikan Vokasi Jurnal Pendidikan Vokasi*, Vol 2, Nomor 1, Februari 2012

- Hiskia Achmad & Lubna Baradja. (2012). *Demonstrasi sains kimia jilid 2: kimia deskriptif melalui demo kimia*. Bandung: Nuansa
- I Made Sukarna. (2003). *Kimia Dasar 1*. Yogyakarta: Jurusan Pendidikan Kimia FMIPA UNY
- Made Wena. (2009). *Strategi Pembelajaran Inovatif Kontemporer: Suatu Tinjauan Konseptual Operasional*. Jakarta: Bumi Aksara
- Mulyati Arifin,.et.al. (2005). *Strategi Belajar Mengajar Kimia*. Malang: UM Press
- Nataša Rizman Herga (2016). Virtual Laboratory in the Role of Dynamic Visualisation for Better Understanding of Chemistry in Primary School. *Eurasia Journal of Mathematics, Science & Technology Education*, 2016, 12(3), 593-608
- Nataša Rizman Herga, Milena Ivanuš Grmek, and Dejan Dinevski. (2014). Virtual Laboratory as an Element of Visualization When Teaching Chemical Contents in Science Class. *The Turkish Online Journal of Educational Technology (TOJET)*, 2014, 13 (4), 157-165
- Oemar Hamalik. (2001). *Proses Belajar Mengajar*. Jakarta: Bumi Aksara
- Oemar Hamalik. (2005). *Kurikulum dan Pembelajaran*. Jakarta: Bumi Aksara
- Ozdener, N. (2005). Using simulation for experimental teaching methods. *Turkish Online Journal of Educational Technology (TOJET)*, 4(4), 93–98
- Ratna Wilis Dahar dan Liliarsari. (1986). *Pengelolaan Pengajaran Kimia*. Jakarta: Departemen Pendidikan dan Kebudayaan Universitas Terbuka
- Raymond Chang. (2005). *Kimia Dasar: Konsep-Konsep Inti Jilid 1*. Jakarta: Erlangga
- Slameto. (2003). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Jakarta: PT Asdi Mahasatya
- Sudarman. (2007). Problem Based Learning : Suatu Model Pembelajaran untuk Mengembangkan dan Meningkatkan Kemampuan Memecahkan masalah. *Jurnal Pendidikan Inovatif, Vol 2 (2)*, 6 halaman
- Sugiyono. (2013). *Cara Mudah Menyusun Skripsi, Tesis, dan Disertasi*. Bandung: Alfabeta
- Sukardjo M. (2009). *Landasan Pendidikan Konsep Dan Aplikasinya*. Jakarta: Rajawali Pers

Tri Saryanto. (2012). Pengembangan Website Laboratorium Virtual Kimia Online untuk Peserta Didik SMA/MA Kelas XI Semester 1. *Skripsi*. Yogyakarta: FMIPA UNY

Undang-Undang No. 20 Tahun 2003 tentang Sistem Pendidikan Nasional

Woodfield, B. (2005). Virtual chemlab getting started. Pearson Education website. Retrieved May 25, 2005, from http://www.mypearsontraining.com/pdfs/VCL_getting_started.pdf.

Yenny Sandra Alexander. (2013). Pengembangan Chemistry Academic Blog sebagai Sumber Belajar Mandiri Peserta Didik SMA/MA Kelas XI Semester Genap Materi Asam Basa. *Skripsi*. Yogyakarta: FMIPA UNY

Yustina Dewi Nuritasari. (2011). Pengaruh Pelaksanaan Praktikum Kimia Menggunakan Virtual Lab terhadap Sikap Ilmiah dan Prestasi Belajar Kimia Peserta Didik Kelas XI Semester II SMA N 1 Ngaglik Tahun Ajaran 2010/2011. *Skripsi*. Yogyakarta: FMIPA UNY

Zeynep Tatli and Alipasa Ayas. (2013). Effect of a Virtual Chemistry Laboratory on Students' Achievement. *Journal Educational Technology & Society*, 16 (1), 159–170.